

Regarding (ii), places with large health care and penal populations will definitely have artificially low death rates, given that deaths are allocated according to current regulations.

The table on page 3 shows each city's 1970 population and the percentages enumerated in institutions and other group quarters.

### Misleading Birth and Fertility Rates

Given the preceding conventions for Census enumerations, it is easily seen that places with large institutional populations will have low birth and fertility rates relative to their true "at risk" population. Although counted in the denominators, institutionalized persons and persons in certain other group quarters are at relatively low risk of contributing to the numerator of a birth or fertility rate. On this basis, one may prefer that denominators be restricted to the population in households (which excludes the population in group quarters). However, these population bases are not available intercensally in North Carolina. Also, use of the household population data would mean that the numerator of a rate could include events not represented in the denominator, for example, a decedent in an institution would not be included in any city or county denominator. Additionally, a county or city could no longer compare itself to places outside North Carolina since other places would be computing rates based on a different kind of denominator.

### The Need for City Statistics

The PHSB routinely publishes reports based on age-race-sex-adjusted death rates. These are and have been of great use to health planners at the state, regional and county levels. In addition to these reports, the PHSB and other users of vital statistics have used these rates for a variety of research projects, often for ecologic studies that attempt to find associations between disease-specific county rates and certain environmental factors (measures of pesticide use, water quality, rurality, etc.).

Ecologic studies are to be distinguished from the more rigorous, definitive, and expensive epidemiologic studies that are based on individuals as the sampling units with individuals being scrutinized for disease classification, exposure histories and other relevant information. The sampling unit of an ecologic study is a set or a defined classification of people; typically, the units are geographically-based, usually counties. Measures of health status (often mortality rates) are collected for each county. In addition, exposure determinations are made for the counties. Even though there may be an observed relationship between the rates and the exposure classifications over the counties, a lack of specificity of what is operative within counties regarding individuals (i) precludes estimates of individual risks and (ii) leaves us blind to possible spurious results (ecologic fallacies).

Environmental factors may vary widely within a county; these factors relate to the number of towns, sizes of towns, industrial and agricultural composition to name a few. Water quality is one important factor and will be used to illustrate some potential problems in the use of small area statistics.

It is almost axiomatic that water sources and water constituent values often fluctuate radically over the geography of a county. This means that to classify counties by several water variables is either a formidable task relying on many sources of data or it leads to unreliable results.